

AMENDMENTS TO THE CLAIMS

This listing of the claims will replace all previously submitted claims:

What is claimed is:

1. - 26. (Cancelled).

27. (Currently Amended) A coreless linear motor comprising:

a fixed member; and

a movable member moving relatively with respect to the fixed member;

said fixed member having a yoke and groups of permanent magnets fixed to the yoke;

said movable member having a coil assembly and a nonmagnetic reinforcing member;

said yoke having first and second facing yoke parts facing each other across a first distance and formed by magnetic materials and a connection yoke part connecting first ends of said first and second facing yoke parts, the first, second and connection yokes being formed by magnetic material;

said groups of permanent magnets including first and second groups of permanent magnets arranged so as to face the facing surfaces of the first and second facing yoke parts, each of said first and second groups of permanent magnets having a plurality of magnets, having two different magnetic poles alternately arranged, along the longitudinal direction of the yoke, in the plurality of magnets of each of said first and second groups of permanent magnets, the magnetic poles of magnets facing each other along the longitudinal direction of the yoke differing from each other, and the facing magnetic poles of the permanent magnets along the longitudinal direction of the yoke being the same;

said coil assembly having at least three coils having rectangular cross-sections and, the three coils forming a hollow shape and the nonmagnetic reinforcing member being fitted into the hollow shape, and arranged movably relative to said first and second groups of permanent magnets along the longitudinal direction of said yoke between the first and second groups of permanent magnets;

each coil being wound by a conductive metal wire;

said at least three coils being arranged and wound solidly in multiple layers, then fastened by a binder, the end surfaces of adjacent coils connected with each other via an electrical insulation member;

said coil assembly and reinforcing member moving in the space between said facing first and second groups of permanent magnets along the longitudinal directions of said yoke.

28. (Withdrawn) A coreless linear motor as set forth in claim 27 wherein in the cross-sectional shape of each coil, a length facing said first and second groups of permanent magnets is longer than a length perpendicular to said first and second groups of permanent magnets.

29. (Currently Amended) A coreless linear motor as set forth in claim 27, wherein said movable member further has a nonmagnetic reinforcing member fit in solid parts of said coils, and

in the cross-sectional shape of said reinforcing member, a length of a side facing said first and second groups of permanent magnets is longer than a length of a side perpendicular to said first and second groups of permanent magnets.

30. (Previously Presented) A coreless linear motor as set forth in claim 29, wherein a hole through which a cooling agent passes is formed inside the reinforcing member.

31. (Previously Presented) A coreless linear motor as set forth in claim 30, wherein heat radiating fins are formed in a hole inside said reinforcing member.

32. (Previously Presented) A coreless linear motor as set forth in claim 29, wherein said reinforcing member is produced by aluminum or an aluminum alloy.

33. (Previously Presented) A coreless linear motor as set forth in claim 29, wherein

said movable member is further provided with a holding member and spacers, and

the two ends of said reinforcing member inserted into said coil assembly are held by said holding member via said spacers.

34. (Currently Amended) A coreless linear motor as set forth in claim 33, wherein said reinforcing member and said spacers are formed by materials having a high heat conductivity and light weight.

35. (Previously Presented) A coreless linear motor as set forth in claim 34, wherein said reinforcing member and said spacers are formed by aluminum or an aluminum alloy.

36. (Currently Amended) A coreless linear motor as set forth in claim 29, wherein the reinforcing member is arranged spaced from the surfaces of the first and second groups of permanent magnets by exactly the ~~a~~ distance whereby the density of the magnetic flux incident upon the surface of the reinforcing member becomes 1/2 or less of the magnetic flux density of the magnets at the center of the surfaces of the facing first and second groups of permanent magnets.

37. (Withdrawn) A coreless linear motor as set forth in claim 27, wherein the length of said three coils in the longitudinal direction of said yoke and the length of two adjoining magnets of said first group of permanent magnets are equal.

38. (Withdrawn) A coreless linear motor as set forth in claim 27, wherein said coil assembly forming an armature has a first set of 3-phase coils and a second set of 3-phase coils generating magnetic fields of opposite phases, and the different phase coils corresponding to the first and second sets of 3-phase coils are arranged adjoining each other.

39. (Withdrawn) A coreless linear motor as set forth in claim 27, wherein said yoke has a square or rectangular cross-section and has first and second facing yoke parts formed by magnetic materials and third and third facing yoke parts perpendicularly intersecting said first and second facing yoke parts and formed by magnetic materials; said groups of permanent magnets have

first and second groups of permanent magnets arranged facing facing surfaces of said first and second facing yoke parts and

third and fourth groups of permanent magnets arranged facing facing surfaces of said third and fourth facing yoke parts;

each of said first and second groups of permanent magnets has a plurality of magnets along a longitudinal direction of said yoke, in the plurality of magnets of said first and second groups of permanent magnets, the poles of the magnets facing each other along the longitudinal direction of said yoke being alternately different, and the poles of the permanent magnets along the longitudinal direction of said yoke being the same; and

each of said third and fourth groups of permanent magnets has a plurality of magnets along a longitudinal direction of said yoke, in the plurality of magnets of said third and fourth groups of permanent magnets, the poles of the magnets facing each other along the longitudinal direction of said yoke being alternately different, and the poles of the permanent magnets along the longitudinal direction of said yoke being the same.

40. (Withdrawn) A coreless linear motor comprising:
 - a fixed member; and
 - a movable member moving relatively with respect to the fixed member;
 - said movable member having groups of permanent magnets arranged at said yoke;
 - said fixed member having a coil assembly;
 - said yoke having first and second facing yoke parts facing each other across a first distance and formed by magnetic materials and a connection yoke part connecting first ends of said first and second facing yoke parts;

said groups of permanent magnets including first and second groups of permanent magnets arranged so as to face the facing surfaces of the first and second facing yoke parts, each of said first and second groups of permanent magnets having a plurality of magnets along the longitudinal direction of the yoke, in the plurality of magnets of each of said first and second groups of permanent magnets, the magnetic poles of magnets facing each other along the longitudinal direction of the yoke differing from each other, and the magnetic poles of the permanent magnets along the longitudinal direction of the yoke being the same;

said coil assembly having at least three coils positioned between said facing first and second groups of permanent magnets, said at least three coils being arranged and wound solidly in multiple layers, then fastened by a binder, the end surfaces of adjacent coils connected with each other via an electrical insulation member;

the movable member having first and second groups of permanent magnets facing said coil assembly and said yoke moving along the longitudinal direction of said coil assembly.

41. (Withdrawn) A coreless linear motor as set forth in claim 40, wherein in the cross-sectional shape of each coil, a length facing said first and second groups of permanent magnets is longer than a length perpendicular to said first and second groups of permanent magnets.

42. (Withdrawn) A coreless linear motor as set forth in claim 40, wherein said fixed member further has a nonmagnetic reinforcing member fit in solid parts of said coils, and

in the cross-sectional shape of said reinforcing member, a length of a side facing said first and second groups of permanent magnets is longer than a length of a side perpendicular to said first and second groups of permanent magnets.

43. (Withdrawn) A coreless linear motor as set forth in claim 42, wherein a hole through which a cooling agent passes is formed inside the reinforcing member.

44. (Withdrawn) A coreless linear motor as set forth in claim 43, wherein heat radiating fins are formed in a hole inside said reinforcing member.

45. (Withdrawn) A coreless linear motor as set forth in claim 42, wherein said reinforcing member is produced by aluminum or an aluminum alloy.

46. (Withdrawn) A coreless linear motor as set forth in claim 42, wherein said fixed member further comprises a holding member and spacers, and the two ends of said reinforcing member inserted into said coil assembly are held by said holding member via said spacers.

47. (Withdrawn) A coreless linear motor as set forth in claim 46, wherein said reinforcing member and said spacers are formed by materials having a high heat conductivity and light weight.

48. (Withdrawn) A coreless linear motor as set forth in claim 48, wherein said reinforcing member and said spacers are formed by aluminum or an aluminum alloy.

49. (Withdrawn) A coreless linear motor as set forth in claim 42, wherein the reinforcing member is arranged spaced from the surfaces of the first and second groups of permanent magnets by exactly the distance whereby the density of the magnetic flux incident upon the surface of the reinforcing member becomes 1/2 or less of the magnetic flux density of the magnets at the center of the surfaces of the facing first and second groups of permanent magnets.

50. (Withdrawn) A coreless linear motor as set forth in claim 40, wherein the length of said three coils in the longitudinal direction of said yoke and the length of two adjoining magnets of said first group of permanent magnets are equal.

51. (Withdrawn) A coreless linear motor as set forth in claim 40, wherein said coil assembly forming an armature has a first set of 3-phase coils and a second set of 3-phase coils generating magnetic fields of opposite phases, and the different phase coils corresponding to the first and second sets of 3-phase coils are arranged adjoining each other.

52. (Withdrawn) A coreless linear motor as set forth in claim 40, wherein said yoke has a square or rectangular cross-section and has first and second facing yoke parts formed by magnetic materials and third and third facing yoke parts perpendicularly intersecting said first and second facing yoke parts and formed by magnetic materials; said groups of permanent magnets have first and second groups of permanent magnets arranged facing facing surfaces of said first and second facing yoke parts, and

third and fourth groups of permanent magnets arranged facing facing surfaces of said third and fourth facing yoke parts;

each of said first and second groups of permanent magnets has a plurality of magnets along a longitudinal direction of said yoke, in the plurality of magnets of said first and second groups of permanent magnets, the poles of the magnets facing each other along the longitudinal direction of said yoke being alternately different, and the poles of the permanent magnets along the longitudinal direction of said yoke being the same; and

each of said third and fourth groups of permanent magnets has a plurality of magnets along a longitudinal direction of said yoke, in the plurality of magnets of said third and fourth groups of permanent magnets, the poles of the magnets facing each other along the longitudinal direction of said yoke being alternately different, and the poles of the permanent magnets along the longitudinal direction of said yoke being the same.

53. (New) A coreless linear motor as set forth in claim 27, wherein the at least three coils have square cross-sections.